

Elementary visual hallucinations in migraine and epilepsy

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Abstract

A comparison of the elementary visual hallucinations of 50 patients with migraine and 20 patients with occipital epileptic seizures showed that epileptic seizures are predominantly multi-coloured with circular or spherical patterns as opposed to the predominantly black and white linear patterns of migraine. This simple clinical symptom of the elementary visual hallucinations may be helpful in distinguishing between classic or basilar migraine and visual partial epileptic seizures, particularly in children. Claims that epileptic seizures are triggered or caused by migraine may be artificial, reflecting problems in the differential diagnosis between the two diseases.

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Elementary visual hallucinations are common in the prodrome phase of classic and basilar migraine and in partial seizures originating from the occipital lobes.^{1,2} Although migraine and epilepsy are often easy to diagnose there are cases, mainly children, with considerable difficulties in their differentiation.¹⁻¹⁰ Elementary visual hallucinations, particularly

when combined with headache, vomiting or blindness are more likely to be diagnosed as characteristic of migraine despite the fact that they are also common ictal manifestations of occipital lobe seizures.¹ If such ictal epileptic migraine-like symptoms are followed by loss of consciousness and convulsions, the diagnosis of seizures triggered by migraine or basilar artery migraine¹¹ is often made.^{2,3}

Children with benign childhood epilepsy and occipital paroxysms (BCEOP) have been reported as having basilar migraine with epileptic seizures³ before BCEOP was established as a benign epileptic syndrome.⁴⁻⁷ Also, it is possible that reports of migraine evolving to seizures^{2,3,12} may reflect the difficulties in recognising epileptic seizures of the occipital lobes, which often present with symptoms imitating migraine (visual hallucinations, headache, and vomiting).

Comparisons of the elementary visual hallucinations between 50 patients with migraine and 20 patients with occipital lobe seizures were prospectively made. Four patients with visual partial seizures who illustrated their elementary visual hallucinations are presented.

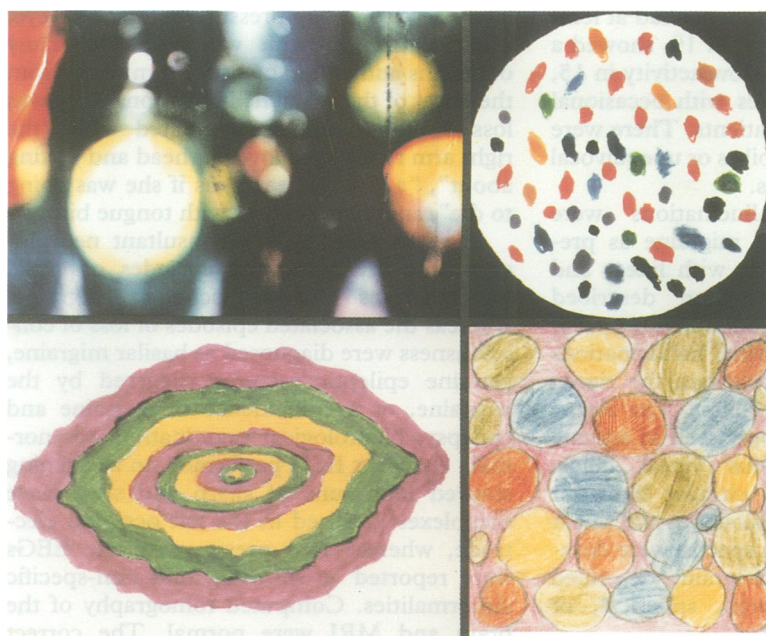
Materials and methods

Patients and methods of investigations including comprehensive EEG studies as well as brain imaging when appropriate, have been described elsewhere.^{1,4,5,7} All patients from 1980 to 1993 with elementary visual hallucinations due either to migraine or epilepsy have been prospectively and systematically interrogated regarding the quality of their hallucinations. They were particularly asked whether their hallucinations were predominantly black and white or coloured and whether the patterns seen were predominantly linear/zigzag or circular/spherical.

Four recently seen patients with visual epileptic seizures were asked to illustrate their elementary visual hallucinations (figure).

TERMINOLOGY

In reviewing the medical records of patients I was impressed that the description of visual hallucinations were often abbreviated in terms such as fortification spectrum, teichopsia, scintillating scotoma, phosphenes, and their variations. Their meaning did not always represent the actual descriptions. This has been emphasised by Plant¹³ in a detailed and well documented historical review of the origin of the term fortification spectra in migraine. The



Visual illusions of occipital lobe epilepsy as perceived and illustrated by the patients: case 1 (top left), case 4 (top right), case 3 (bottom left), case 2 (bottom right).

migrainous elementary visual hallucinations are called fortifications because of their similarities to the bastioned, star patterned, pentagonal fortifications and not of the castellated appearances of battlements.

I was startled by a singular shadowy appearance at the outside corner of the field of vision of the left eye. It gradually advanced into the field of view and then appeared to be a pattern in straight-lined angular forms, very much in general aspects like the drawing of a fortification, with salient and re-entering angles, bastions, and ravelins with some suspicion of faint lines of colour between the dark lines.

Sir JFW Herschel (1866)¹⁴

(Note: a bastion is a projecting part of a fortification, consisting of an earthwork in the form of an irregular pentagon, having its base in the main line or at an angle of the fortification. A ravelin is an outwork consisting of two faces that form a salient angle, situated in front of the bastions.)

Spectrum is also used by Gowers¹⁵ to mean apparition and not a coloured band of light.¹³

The name 'Teichopsia' (teichos = town wall, opsia = vision) to represent the bastioned form of transient hemiopia which I have been describing, not without a reminiscence of some words of Tennyson's:

as yonder walls
Rose slowly to a music slowly breathed,
A cloud that gathered shape
Airy (1870)¹⁶

Scintillating (scintilla = spark) scotoma (skotos = darkness) is also used because of the sparking appearance of the visual hallucinations of migraine (brilliant flashes of light in the periphery of dark areas in the visual fields).

Photopsias (phos = light, opsia = vision) are unformed flashes of light and sparks.

Results

There were 47 patients with classic and three with basilar migraine. They were aged 7–60 years. Forty four of these patients had at least one EEG, which was normal in 19, showed a moderate excess of diffuse slow activity in 15, and paroxysmal theta waves with occasional sharp components in 10 patients. There were no patients with occipital spikes or unequivocal epileptogenic abnormalities.

Elementary visual hallucinations were described by patients with migraine as predominantly black and white with linear and zigzag patterns. Patients often described colours, which were not predominant, mainly in the periphery of their visual hallucinations or faint coloured lines along with the zigzag bright streaks or flashes of light. The zigzag shaped lights were commonly seen in arcuate shape across homonymous visual fields. Rarely patients described circular lights or rounded obscuration of vision but the linear patterns of the fortification spectra were dominating. No patient with migraine described predominantly multicoloured, spherical, or circular patterns.

In 20 patients (age range 7–47 years) with idiopathic or symptomatic visual partial

seizures, hallucinations were predominantly multicoloured, with circular or spherical patterns. Two patients described predominantly square and a third patient triangular multicoloured patterns but no black and white lines or zigzag patterns. In another patient with symptomatic seizures the attack would start with a "ball of bright red in the right visual field which would move to the right side" followed by deviation of the eyes marching to simple motor partial and secondary generalised tonic-clonic seizures. None of the patients had the zigzag linear, black and white patterns of the migraine prodrome. No patient described visual hallucinations similar to the scintillating scotoma, photopsias, fortification spectra, or teichopsias of migraine. Three had BCEOP, nine symptomatic seizures due to occipital lobe lesions; two an unusual form of photosensitivity (which in one of them was associated with absence seizures and eyelid fluttering) and occipital lobe epilepsy; no underlying cause was found in the remaining six patients. The clinical diagnosis of epilepsy was unequivocally confirmed in all patients either because of spike and slow wave activity in the occipital regions or structural occipital lobe lesions.

The histories of four patients who have provided illustrations of their hallucinations (figure) are as follows:

CASE 1

This woman, born in 1969, was referred to me in 1992 with a diagnosis of migraine associated with epilepsy. At 9 years of age she started to have frequent episodes of visual hallucinations and headache on awakening between 5.30 and 6.30 am every one to two months. The visual hallucinations consisted of vivid, flashing multicoloured lights and circular patterns that occupied her visual fields and obscured her vision (figure). Severe unilateral headache followed one to two minutes later, described like pressure behind one eye, often associated with vomiting. On many occasions and within one to two minutes from the onset of the visual hallucinations there was loss of consciousness associated with "the right arm rising up above her head and jerking about", "a strange feeling as if she was going to die", and "convulsions with tongue biting".

She was seen by five consultant neurologists who attributed the episodes of visual hallucinations and headache to migraine, whereas the associated episodes of loss of consciousness were diagnosed as basilar migraine, genuine epileptic seizures triggered by the migraine, or a coincidence of migraine and epilepsy. Neurological examination was normal. A recent EEG performed on awakening showed long runs of sharp and slow wave complexes localised in the left occipital electrode, whereas four previous routine EEGs were reported as showing mild non-specific abnormalities. Computed tomography of the brain and MRI were normal. The correct diagnosis is visual partial seizures with secondary generalisation.

CASE 2

This boy was born in 1980. At the age of 10 years he had frequent visual disturbances lasting for 10–30 seconds, rare and brief episodes of complete blindness without warning or impairment of consciousness, and four episodes of loss of consciousness without convulsions, that lasted one to two minutes.

Simple visual hallucinations (he called them visions) were described as follows: "I saw my 'visions' in my right eye and they draw my right eye and my head to the right. It looked like a rectangle filled with coloured small circles. This time I saw the colours: they were blue, green, red, and yellow... They are always in my right eye and draw my right eye and my head to the right."

One of the four episodes of loss of consciousness was witnessed by a physician who described it as "clumsiness, vacant, unresponsive for a minute or so. No convulsions." Another one was described by his parents: "He was next to us in a shop. We heard a bang and saw him on the ground. He was pale. He was out for a few seconds."

Pronounced fixation-off sensitivity⁷ was demonstrated with video-EEG, which showed continuous, high amplitude, occipital paroxysms only under conditions where fixation and central vision were eliminated.⁷ His brain CT was normal. All episodes resolved with carbamazepine (100 mg twice daily) in a three year follow up period.

The diagnosis is late onset benign childhood epilepsy with occipital paroxysms.

CASES 3 AND 4

These men, aged 22 and 36, have intractable symptomatic visual partial seizures due to occipital lobe infarcts as demonstrated on MRI.

Discussion

This report shows that elementary visual hallucinations of visual partial epileptic seizures have different characteristics to those of migraine. Visual epileptic seizures are predominantly multicoloured with circular/spherical patterns as opposed to the predominantly black and white zigzag linear patterns described by patients with migraine. These findings are supported by other reports where elementary visual hallucinations of epileptic seizures are described as multicoloured and circular: "millions of small, very bright, coloured, mainly blue and green, circular spots of light",⁴ "moving multicoloured flashing spots",⁶ "single or multiple coloured spots that often rotated",⁸ "coloured balls of light in which red predominates",¹² "brightly coloured discs",⁹ "phosphenes described as round, coloured, flickering luminous shapes".¹⁷

To test the clinical validity of this finding I asked other physicians with an interest in migraine and epilepsy to notify me of any patients who did not justify the observation that visual epileptic seizures are predominantly multicoloured and spherical/circular whereas the migraine hallucinations are pre-

dominantly black and white with linear patterns. There was a child aged 10 years who had multicoloured hallucinations with spherical patterns; all other clinical symptoms were characteristic of classic migraine and his EEG was normal. Conversely, a case with symptomatic seizures due to a low grade astrocytoma may have had seizures with predominantly black and white patterns. Another patient had visual epileptic seizures with hexagonal polychromatic patterns.

Case 1 of this report illustrates that clusters of symptoms such as elementary visual hallucinations, and episodes of blindness, headache, and vomiting are more likely to be diagnosed as migraine. This is also typical of most children with the late onset variant of childhood epilepsy with occipital paroxysms,^{1–10} illustrated by case 2.

Reported cases of epileptic seizures triggered by migrainous attacks may reflect difficulties in differentiating the prodromal visual phenomena of migraine from the elementary visual hallucinations of epileptic seizures. A review of relevant reports often shows that the visual hallucinations were either poorly described or that they consisted of "circular lights of many colours"—that is, they were probably visual partial seizures. A widely cited paper on the relation of migraine and epilepsy is by Basser¹²; two cases "where the same or similar aura leads sometimes to migraine and sometimes to epilepsy" are relevant to my findings. One of these patients (case 3 in his report)¹² was a child with typical absence seizures as indicated by his EEG with "high voltage spike and wave complexes" and brief clinical events of "twitching of the eyelids". There is also a complex paroxysmal symptomatology before the child "sees a bright shining blue spot", which leads either to headache and vomiting (interpreted as migraine) or to a "grand mal seizure". The other patient, a 37 year old woman (case 4 in his report) had epileptic seizures in childhood preceded by "large blobs of coloured light" and developed in adult life recurrent headaches which follow visual disturbances of "lines and strakes of light that are white" not accompanied by epileptic fits.¹²

The predominantly black and white, linear zigzag patterns of migraine are illustrated in all relevant books of migraine and reflected in their terminology (scintillating scotoma, fortification spectra, teichopsias).^{14–16} That colours may be seen in the course of migrainous visual hallucinations has been described well even before the time of Gowers.^{13–16} Spots, circles, and beads with or without colours may also be seen by some patients with migraine.¹⁸ Colour and circular/spherical patterns in migraine, however, are considered as part of the scintillating scotoma and teichopsias and not as the predominant feature of the migrainous visual hallucinations. Conversely, none of the patients with occipital epileptic seizures experienced the predominantly black and white scintillating scotoma and fortification spectra of migraine. This has previously been reported in patients with symptomatic visual

partial seizures.¹⁹ Furthermore, a recent exhibition of the artistic impression of migraine, organised by the British Migraine Association and Glaxo, showed that although most of the visual hallucinations were painted with colours, all but one had linear, mainly zigzag patterns. None could be confused with the illustrations presented in the figure in this report.

In conclusion, the characteristics of the elementary visual hallucinations are often different in migraine and epileptic seizures. This may be a useful clinical guide in the differential diagnosis of migraine and epilepsy, especially when combined with other clinical details (visual hallucinations in seizures are brief, mostly lasting for one to two minutes, onset is always on the same side, and headache is rarely throbbing; vomiting may be common in both) and laboratory findings (occipital paroxysms in BCEOP, generalised spike and slow waves in idiopathic generalised epilepsies, focal EEG findings, and structural abnormalities on brain imaging in symptomatic epilepsies). There are more differences in the chronological sequence and the quality of the symptoms between migrainous and epileptic events but this is beyond the purpose of this report.¹

Furthermore, it is suggested that the concept of epileptic seizures triggered by migrainous events should be re-evaluated; most reported cases are probably genuine visual partial epileptic seizures imitating migraine. Elementary visual hallucination should better be described rather than abbreviated in terms such as scintillating, fortification, and teichopsia, which are often confusing. More importantly elementary visual hallucinations, blindness, headache, and vomiting, which are common manifestations of occipital lobe epilepsies, should not be unquestionably equated with migraine.¹

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